INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/02261

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :H05B 3/00
US CL :219/213, 679; 404/71; 14/73, 78; 106/640

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 219/213, 679, 553, 646; 404/71, 79; 14/73, 78; 106/640-644; 392/435; 252/503

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Please See Extra Sheet.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	CA 836117 A (PFERSCHY) 03 March 1970, see P. 1, lines 3 and 6, page 4, lines 11-13.	1-10,17-19, 21-26, 28, 31, 35-37 ------ 14-16, 20, 27, 29, 30, 32-34, 38-41
Y	SASAKI, M. et al, "Snow Melting System With Electric Heating Using Photovoltaic Power Generation", Hachinohe Kogyo Daigaku Kiyo (Bulletin of Hachinohe Institute of Technology) 1997, vol. 16, pp. 107-116. (Abstract only)	11-13, 29, 32
X	CA 1117579 A (PAYNE et al) 02 February 1982, see entire doc.	1-7, 9, 10, 17-19, 35-37

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search	Date of mailing of the international search report
06 APRIL 2000	06 JUL 2000
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer JOHN A. JEFFERY Diane Smith for Telephone No. (703) 308-0858

Form PCT/ISA/210 (second sheet) (July 1998)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/02261

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3573427 A (MINSK) 06 April 1971, see entire doc.	1-7, 9, 10, 17-19, 35-37
A	US 5707171 A (ZALESKI et al) 13 January 1998, see entire doc.	1-41
A	US 3377462 A (PFERSCHY) 09 April 1968, see entire doc.	1-41
A	US 4697063 A (GERMUNDSON) 29 September 1987, see entire doc.	1-41
A	US 4301356 A (TANEI et al) 17 November 1981, see entire doc.	1-41
A	US 5030282 A (MATSUHASHI et al) 09 July 1991, see entire doc.	1-41
A	GB 1363429 A (ELECTRICITY COUNCIL) 14 AUGUST 1974, see entire doc.	1-41

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/02261

B. FIELDS SEARCHED
Electronic data bases consulted (Name of data base and where practicable terms used):

Derwent WPI, JAPIO, Engr. Materials Abstracts, International Construction Database, Road and Transport Information Database, Japan Center for Sci. and Tech DB, PATDD, RussSCI DB
Search Terms: concrete, mortar, cement, road, roadway, motorway, pavement, asphalt, bridge, bridges, sidewalk, sawdust, wood powder,

14

PATENT COOPERATION TREATY

PCT

REC'D 30 MAR 2001
WIPO PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rul 70)

Applicant's or agent's file reference UNVN69827/05	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/US00/02261	International filing date *(day/month/year)* 28 JANUARY 2000	Priority date *(day/month/year)* 29 JANUARY 1999
International Patent Classification (IPC) or national classification and IPC IPC(7): H05B 3/00 and US Cl.: 219/213, 679; 404/71, 79; 14/73, 78; 106/640		
Applicant BOARD OF REGENTS OF UNIVERSITY OF NEBRASKA		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 6 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of report with regard to novelty, inventive step or industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
29 AUGUST 2000	09 MARCH 2001
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer JOHN A. JEFFERY Diane Smith Telephone No. (703) 308-0858

Form PCT/IPEA/409 (cover sheet) (July 1998)★

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US00/02261

I. Basis of the report

1. With regard to the elements of the international application:*

☐ the international application as originally filed

☒ the description:
pages (See Attached), as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

☒ the claims:
pages (See Attached), as originally filed
pages _____, as amended (together with any statement) under Article 19
pages _____, filed with the demand
pages _____, filed with the letter of _____

☒ the drawings:
pages (See Attached), as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

☒ the sequence listing part of the description:
pages (See Attached), as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in printed form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the writen sequence listing has been furnished.

4. ☒ The amendments have resulted in the cancellation of:

☒ the description, pages NONE

☒ the claims, Nos. NONE

☒ the drawings, sheets/~~fig~~ NONE

5. ☐ This report has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

** Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

***Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.*

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US00/02261

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. statement

Novelty (N)	Claims	1-45	YES
	Claims	NONE	NO
Inventive Step (IS)	Claims	38, 39, 42-44	YES
	Claims	1-37, 40, 41, 45	NO
Industrial Applicability (IA)	Claims	1-45	YES
	Claims	NONE	NO

2. citations and explanations (Rule 70.7)

Claims 1-7, 11-22, 24, 25, 27-33, 35-37, 40, 41, and 45 lack an inventive step under PCT Article 33(3) as being obvious over CA836117 (Pferschy) in view of Xie et al (US5447564). CA836117 (Pferschy) discloses a bridge heating system comprising an electrically conductive concrete coupled to an electric power source to impart heat to the bridge. See Page 3, line 31 - Page 4, line 4. According to Page 4, lines 11-13, a concrete layer can be rendered sufficiently conductive by suitable admixtures which can function as a heating element. The claims differ from Pferschy in calling for the electrically conductive materials to include metal fibers and particles. Providing both electrically conductive fibers and particles together in an electrically conductive concrete mixture is conventional in the art as evidenced by Xie et al who in Col. 4, lines 56-67 teaches using both electrically conductive fibers in addition to particles. The use of conductive fibers forms a conductive network and the use of particles increases the contact area of the conductive phase via the fiber-particle-fiber or fiber-particle-particle pathwahys. In view of Xie et al, it would have been obvious to the ordinary routineer in the art to use both electrically conductive fibers and particles in the conductive concrete mixture of Pferschy in order to increase the contact area of the conductive phase via the fiber-particle-fiber or fiber-particle-particle pathwahys. The claims also differ from Pferschy in calling for a moisture sensor and temperature sensors. However, the use of such sensors to detect moisture on the structure and the temperature of the air and concrete in heated static structures are known in the art so that a heater associated therewith can be controlled responsive to the sensed environmental conditions thereby automatically controlling heater operation and precluding the need to manually turn on and off the heater. In view of the well known usage of such sensors, it would have been obvious to the ordinary routineer in the art to use such sensors in conjunction with the previously described apparatus so that a heater associated therewith can be controlled responsive to the sensed environmental conditions thereby automatically controlling heater operation and precluding the need to manually turn on and off the heater.

(Continued on Supplemental Sheet.)

Supplemental B x
(T be used when the space in any of the preceding boxes is not sufficient)

C ntinuation of: Boxes I - VIII

I. BASIS OF REPORT:

This report has been drawn on the basis of the description,
page(s) 1-23, as originally filed.
page(s) NONE, filed with the demand.
and additional amendments:
NONE

This report has been drawn on the basis of the claims,
page(s) NONE, as originally filed.
page(s) NONE, as amended under Article 19.
page(s) NONE, filed with the demand.
and additional amendments:
Pages 24-29, filed with the letter of 22 January 2001.

This report has been drawn on the basis of the drawings,
page(s) 1-4, as originally filed.
page(s) NONE, filed with the demand.
and additional amendments:
NONE

This report has been drawn on the basis of the sequence listing part of the description:
page(s) NONE, as originally filed.
pages(s) NONE, filed with the demand.
and additional amendments:
NONE

V. 2. REASONED STATEMENTS - CITATIONS AND EXPLANATIONS (Continued):

Claims 8-10, 23, 26, and 34 lack an inventive step under PCT Article 33(3) as being obvious over CA836117 (Pferschy) in view of Xie et al and further in view of the Sasaki article. The claims differ from the previously cited prior art in calling for a photovoltaic cell and storage device to which the conductive concrete is coupled. Providing a photovoltaic cell in conjunction with electrically conductive concrete is known in the art as evidenced by the Sasaki article wherein a snow melting system is powered via a photovoltaic cell and storage device thereby enabling use of the heater system in remote areas located at far distances from commercial AC power. In view of the Sasaki article, it would have been obvious to the ordinary routineer in the art to use a photovoltaic cell and storage device in conjunction with the previously described apparatus to enable use of the heater system in remote areas located at far distances from commercial AC power.

Claims 38, 39, and 42-44 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest applying an RF signal across the conductive layer to create microwave heating of the bridge deck to deice the same.

---------- NEW CITATIONS ----------
US 5,447,564 A (XIE et al) 05 September 1995, see Col. 4, lines 56-66 and Fig. 1.